Overview: Many physical and natural phenomena depend on more than one single variable. The physicist who studies the trajectory of a particle or the astronomer who studies the motion of a planet needs to understand geometry in two or three dimensions. In Vector Calculus we study curves in two and three dimensions as well as we discuss the multidimensional versions of the Derivative, the Integral and the Fundamental Theorems of Calculus. These ideas are very important in Geometry, Physics and Astronomy.

Learning outcomes: The students will be expected to master the following learning outcomes.

1. Vectors and vector valued functions
   (a) Dot and cross products (sections 12.3 and 12.4)
   (b) Equations of lines and planes (section 12.5)
   (c) Arc length, Curvature (section 13.3)

2. Optimization of functions of several variables
   (a) Partial derivatives, tangent planes, directional derivatives, chain rule, implicit differentiation, gradient, (sections 14.3-14.6)
   (b) Maximum and minimum values (section 14.7)
   (c) Lagrange multipliers (section 14.8)

3. Double and Triple integrals
   (a) Double integrals in polar coordinates (section 15.4)
   (b) Triple integrals (section 15.6)
   (c) Triple integrals in cylindrical and spherical coordinates (sections 15.7 and 15.8)

4. Line integrals
   (a) Line integrals (section 16.2)
   (b) The fundamental Theorem for line integrals (section 16.3)
   (c) Green’s Theorem (section 16.4)

Text: Calculus Early Transcendentals, James Stewart, 6E. It is brought to my attention that it is cheaper to purchase the textbook directly from the publisher than from the University bookstore. The link to the publisher is:

Prerequisites: Completion of Math 142 with a grade of C or better, or qualification by placement.

Grading: There are 12 learning outcomes for this class which are grouped into 4 groups. Each group corresponds to an exam. Each exam will have 3 questions (corresponding to items (a), (b), and (c) above). You will have chances to retake exams. At the date of the 2nd exam you will receive two exams (one for the 1st learning outcome and one for the 2nd); at the date of the 3rd exam you will receive 2 exams (one for the 2nd learning outcome and one for the 3rd); at the date of the 4th exam you will receive 2 exams (one for the 3rd learning outcome and one for the 4th); at the date of the final you will receive 4 exams (one for each learning outcome). Thus you have up to 2 retakes for exams 1, 2 and 3, and you have up to 1 retake for exam 4. However when you are given a retake of an exam you do not need to take the whole exam. You can (if you like), choose selected problems and I will update your grades on those problems. If you are happy with your grade on some problem of some exam, (for example the first problem of the second exam, which is
on partial derivatives), then you do not need to solve the same problem, (in the above example: the partial derivatives), again. If you are happy with your grades that you obtained on the 12 problems before the date of the final then you do not need to come on the day of the final exam. If you are happy with the grades that you have on some of the 12 problems but not with the grades that you have on other problems, then you can come to the final exam to solve only the problems for which you are not happy with your grades. Every time that you solve a problem that you have solved before I will keep the best of your performances on that problem. If you miss an exam because of a documented reason of illness or family emergency or participation in a University sponsored event, and if you inform me before the exam, and if you provide me with appropriate documentation, then I will arrange for a make-up exam.

Homework will be assigned regularly and graded via the WebAssign. Working on the homework will be critical in understanding the materials.

Throughout the semester there will also be quizzes. The quizzes serve the following three purposes: Firstly to examine your knowledge on materials which are not limited to the learning outcomes (for example the materials that are less important than the above learning outcomes), secondly to help you practice for the exams, and thirdly to make sure that you study constantly throughout the semester and not just before the exams.

At the end of the semester I will compute your grade for each exam by averaging your performance in the topics of that exam. In order to pass the class you must receive at least least 50 % in each of the 4 exams. If this condition is fulfilled, then your grade in this course will be the average of your grades in the 4 exams minus a possible penalty. There will be no penalty if the average of your homeworks as well as the average of your quizzes is at least 50 %. Course grades will be determined according to the scale: A 90-100, B+ 85-89, B 80-84, C+ 75-79, C 70-74, D+ 65-69, D 60-64 F 0-59. The possible penalty will be to take off half letter grade if either the average of your homework or the average of your quizzes, (exactly one of the two), is less than 50 %. The possible penalty will be to take off a whole letter grade if, both, the average of your homework and the average of your quizzes is less than 50 %.

Important dates:
- Thursday September 10th, (tentative date for the first exam).
- Thursday October 15th, (tentative date for the second exam).
- Monday October 12th, (last day to drop a course or withdraw without a grade of "WF" being recorded).
- Thursday November 5th, (tentative date for the third exam).
- Tuesday November 24th, (tentative date for the fourth exam).
- Thursday, December 10 at 12:30 p.m. (the final exam).

Attendance policy: Attendance will not be recorded, but if you do not have at least 50% in quizzes then a penalty will be applied as explained above.

WebAssign: Homework will be assigned via WebAssign. Please visit the web site:
https://www.webassign.net/login.html and enter the class key. The class key is:
sc 9592 1613
Help is provided at the web site:
http://services.cengage.com/dcs/ewa/start/resourcelist/
Help by e-mail can be obtained by sending an e-mail to:
student_help@webassign.net
Help by phone can be obtained by calling:
Toll-free: (800) 955-8275 or local: (919) 829-8181
Monday through Friday: 9:00am to 10:00pm (EST) and
Sunday: 11:00am to 8:00pm (EST)
24/7 Live chat can by obtained by visiting: www.cengage.com/support

**Quizzes:** Quizzes will be given un-announced on questions similar to the homework problems from
the latest section that is covered. These quizzes will be graded by a grader. If you miss a quiz
because of a documented reason of illness or family emergency or participation in a University
sponsored event, and if you inform me before the quiz, and if you provide me with appropriate
documentation, then you will be excused from the quiz.

**Student Success Center:** The Student Success Center provides peer tutoring from other under-
graduates that have passed your class with high grade. For more information please see their web
site:
https://www.sa.sc.edu/ssc/

**Academic honesty:** Cheating and plagiarism will not be tolerated in this course. Violations of
this policy will be dealt with a matter consistent with University regulations.

**Cell phones, computers and newspapers:** Turn off cell phones during classes. You are not
permitted to use computers or read a newspaper inside the classroom, because this distracts the
rest of the students and me.